FACE INVESTIGATION

SUBJECT: Electrician Electrocuted after Contacting an Energized Electric Hand Drill

SUMMARY: A 45-year-old male electrician (the victim) was electrocuted when he contacted an energized ½-inch metal-cased electric drill. The victim had been contracted to install electrical wiring in a residence under construction. He was in the process of drilling holes in overhead joists when the incident occurred. There were puddles of water on the cement floor of the work site. The drill was connected to a temporary power pole by a series of three extension cords, two of which were missing the ground pin. One cord was missing outer insulation jacket at both ends exposing the wiring for about ½ inch. The cords extended through the doorway outside to the power pole, where the ends were lying on the ground in puddles of rainwater and mud from recent heavy rainfalls. The cords were plugged into a ground fault circuit interrupter (GFCI) receptacle mounted on the power pole. The power pole had been inspected and certified as meeting local municipality code requirements prior to having the utility company install the meter. However, testing after the incident disclosed the GFCI was inoperative, and the fuse box for the 120 volt single phase 15- and 20-ampere receptacle outlets located at the power pole contained two 40-ampere fuses. After the victim failed to respond to phone calls from the contractor, the contractor proceeded to the work site and found the victim lying face down on top of the drill. The police responded to the contractor's call for assistance and after arriving at the scene, disconnected the power source before examining the victim. The police determined that rigor mortis had set in, and called the coroner to the scene. The coroner arrived 45 minutes later and pronounced the victim dead on the scene. The victim was self-employed, and there were no witnesses to the incident. The Wisconsin FACE investigator concluded that, in order to prevent similar occurrences, the employer should:

- **Ensure that electrical service supplied to a construction site complies with all OSHA standards, the National Electric Code, and local regulations.**

- **Implement a preventive maintenance program to keep cords, plugs, receptacles, and tools in good operating condition.**

- **Test ground fault circuit interrupters on a daily basis.**

- **Evaluate work areas to identify hazardous work conditions.**

INTRODUCTION: On August 10, 1993, a 45-year-old male electrician (the victim) was electrocuted while using an electric hand drill. The Wisconsin FACE investigator was notified by the Wisconsin Department of Industry, Labor, and Human Relations, Workers Compensation Division, on August 11, 1993. On August 12, 1993, the WI FACE field investigator conducted an investigation of the incident. The police officers who responded to the 911 call were interviewed, and a visit was made to the site of the incident. Photographs were taken of the electrical equipment that the victim had been using at the time of

the incident. A death certificate, coroner's report, police report and newspaper clippings were obtained.

The victim was a self-employed electrician, and had no employees. At this time, no additional information could be obtained about the victim's training, work experience, years of operation, or safety program.

INVESTIGATION: The victim was a self-employed electrician who was contracted to install new electrical wiring in a residence under construction. He had been working at the residence for several days before the incident occurred. On the day of the incident, the victim arrived at the residence and proceeded to the basement where he began using a ½-inch electric drill to drill holes in the overhead joists. The drill was attached to a series of three extension cords. Two of these cords had missing grounding pins, and one of the cords was missing outer insulation for about ½ inch from each end exposing the wires. These cords extended through a doorway to the outside, where the receptacle ends were lying in puddles of rainwater and mud from recent heavy rainfalls. The cords were plugged into a ground fault circuit interrupter (GFCI) receptacle mounted on a temporary construction power pole which had been previously certified by the local municipality.

On the afternoon of the incident, the contractor was unable to reach the victim by phone, so he went to the work site where he found the victim lying in a puddle of water on the cement floor. The contractor called 911, and the police were the first respondents to the scene. The police found the victim lying face down with the electric drill underneath him, and disconnected the extension cord from the drill prior to conducting a preliminary assessment of the victim. Rigor mortis was noted, and no pulse could be located, so EMS were notified to slow down. The police also disconnected the extension cord from the receptacle of the GFCI located on the power pole. The coroner arrived, and pronounced the victim dead at the scene. The police interviewed the contractor, a neighbor to the residence under construction, and an individual who had been working in the upstairs portion of the building, but none of these individuals had any additional information about the incident.

An electrical investigator from the utility company and a local licensed electrician arrived and tested the GFCI with an volt meter, and received readings of 120V from both sockets. They pressed the test button on the GFCI several times, and could not get it to trip out. They noted the ground pin was clipped off of the extension cord that had been plugged into the GFCI socket, and that there were 40-ampere fuses in the fuse box on the power pole. They also noted that the power post was properly grounded with two ground rods.

CAUSE OF DEATH: The coroner's report listed the cause of death as electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that electrical service supplied to a construction site complies with all OSHA standards, the National Electric Code, and local regulations.

Discussion: OSHA Standard 29 CFR 1926.404(b)(1)(ii) states, "All 120-volt, single-phase, 15- and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building

or structure and which are in use by employees, shall have approved ground-fault circuit interrupters for personnel protection." A similar requirement is stated in Article 305-6(a) of the National Electrical Code. The fuse box for the receptacle outlets on the power pole contained two 40-ampere fuses, and a subsequent investigation revealed that the GFCI was inoperable.

Recommendation #2: Employers should implement a preventive maintenance program to keep cords, plugs, receptacles, and tools in good operating condition.

Discussion: Two of the extension cords that were connecting the drill to the power pole were missing the ground pin. One cord was missing insulation at both receptacles, with wires exposed for about ½ inch. The case of the GFCI was chipped and soiled, which could indicate possible internal damage. Preventive maintenance programs should be implemented to keep cords, plugs and receptacles in good/safe operating condition.

Recommendation #3: Test ground fault circuit interrupters on a daily basis.

Discussion: Inspection of the GFCI after the incident revealed that it did not function properly. Daily testing of GFCI's should be conducted to ensure they function properly. This incident might have been prevented if the GFCI had been tested prior to the start of the day's work.

Recommendation #4: Evaluate work areas to identify hazardous work conditions.

Discussion: The immediate work site (the basement area) had puddles of water. The outside area, where the power pole was located, was muddy and also had areas of standing water. The three extension cords extended from the basement to the power pole, and were lying in water or mud at several points. Employers should evaluate the work areas to identify hazardous conditions, and take appropriate preventative measures such as hanging the extension cords above ground.

REFERENCES:

1. Office of the Federal Register, Code of Federal Regulations, Labor, 29 CFR Part 1926.404(b)(1)(ii), U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C., July 1989.

2. National Fire Protection Association, National Electrical Code, 1990 edition, Article 305-6(a).